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PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

5   Applicant: Teng-Yen Huang

Filing Date: 11/16/2003   Art Unit: 1756

Application No.: 10/707,025   Docket No.: NTCP0012USA

10   Title: OPTICAL PROXIMITY CORRECTION METHOD

To: Commissioner for Patents

P.O.BOX 1450

Alexandria, VA 22313-1450

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Subject: Information disclosure statement Under 37 C.F.R. §1.56.

Dear Sir:

20   This is an Information Disclosure Statement in accordance with the duty to disclose information material to patentability under 37 C.F.R. §1.56. The applicant wishes to make of record the documents listed on the accompanying form PTO/SB/08. It is respectfully requested that the examiner initials the cited reference on the form and that it be made of

25   record in the application and that a copy of the initialed form be sent to the applicant with the next communication from the Examiner.

Since the IDS is filed before the mailing date of a first Office action on the merits, a petition to request consideration of the information

30   disclosure statement is hereby requested according to 37C.F.R.§1.97(b). The prior art patents contained in the information disclosure statement were cited in communications from the Taiwan Intellectual Property

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Office on February 23, 2004. The applicant sincerely hopes that the Examiner can consider the item contained in the information disclosure statement.

5   According to the requirement set forth in 37 CFR §1.98 and MPEP 609, the applicant is submitting a copy of Taiwan Patent documents TP publication No. 408367 (published October 11, 2000), No. 485271 (published May 1, 2002), and No. 499707 (published August 21, 2002), and a concise explanation of the relevance to this applications

10   hereinafter. For convenience, the independent claims 1 and 11 of the present application are appended at the end of this response.

TP 408367 teaches a method for correcting a photomask pattern, the purpose of which is to avoid the influence of the OPE of a lithography

15   system, as shown in Figs.1A-1B. Figs.3A-3C are schematic diagrams of a first preferable embodiment of the method for correcting a photomask pattern. As shown in Fig.3A, an original photomask pattern 40 is selected. Then, as shown in Fig.3B, a first correction process is performed, which is an OPC process that corrects the original

20   photomask pattern 40 to produce a first corrected photomask pattern 42. For example, pluralities of OPC features 44 are added near the corners of the original photomask pattern 40. Referring to Fig.3C, a second correction process is performed to obtain a second corrected photomask pattern 46. During the second correction process, a Boolean logic

25   calculation system, such as CATS, is used to correct the circumference of the first corrected photomask pattern 42. For example, several assist features 49 are added near the corners of the OPC features 44. Therefore, the second corrected photomask pattern 46, the final photomask pattern, includes the OPC features 44 and the assist features 49. The overlapping

30   region 48 presents the overlapping portion of the OPC features 44 and the assist patterns 49.

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There are three kinds of assist patterns determined according to the size of the overlapping region of the OPC feature and the assist pattern, which are the aggressive assist feature, the moderate assist feature, and the conservative assist feature shown in Figs.4A-4C respectively.

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Regarding TP 485271, which corresponds to US Patent No. 6,638,664 and teaches an optical mask correction method. Figs.3A-3D are schematic top views showing the progression of steps for correcting a mask pattern. As shown in Fig.3A, a T-shaped original pattern 306

10   having a first strip-like pattern 302 and a second strip-like pattern 304 thereon is provided. As shown in Fig.3B, a first modification step is conducted to add a pair of assistant patterns 308 to the respective sides of the first strip-like pattern 302 to form a first modified pattern 310, wherein the assist patterns 308 are linear. Then, a second modification

15   step is performed so that a portion of the first strip-like pattern 302 is reduced to form a second modified pattern 312, as shown in Fig.3C. The reduced dimension of the portion of the first strip-like pattern 302 is the critical dimension of a main pattern. As shown in FIG.3D, a third modification step is conducted, which means an optical proximity

20   correction method is used to modify the second modified pattern 312 to form a third modified pattern 314.

Regarding the third prior art patent, TP 499707 discloses an optical proximity correction method, which corresponds to US patent No.

25   6,472,108. Please refer to Fig.3, a simulator is used to calculate and correct the main pattern 100 to be transferred in FIG.1. When the width of a feature of the main pattern 100 is smaller than the wavelength of light, assist features, such as scattering bars 320, are added to the layout pattern. The assist features, such as scattering bars, and the layout

30   pattern can be defined as a same layer type, or alternatively, as a different layer type. Then, a simulator is used to perform calculations on the original, two-dimensional pattern based on the specific reference

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indexes of the coordinate system. According to these calculations, a series of features are added to change the shape of the original pattern so as to form the corrected pattern 300. However, the assist features, such as scattering bars, are not included in the process of calculation
5   and correction.

Claims 1 and 11 of the present application are repeated below for reference:

10   "1. An optical proximity correction (OPC) method for correcting a photomask layout, the photomask layout comprising at least a first photomask pattern including a first straight line having a first line-end arranged in a first direction and a second straight line arranged in parallel with the first straight line, the second straight
15   line having a second line-end being longer and more protrudent than the first line-end, the OPC method comprising:

performing a rule-based OPC process to generate a corrected photomask layout; and

adding an enhancing feature in the first line-end, a width of the
20   enhancing feature being smaller than a width of the first straight line, and the second line-end being still more protrudent than the first line-end with the enhancing feature.

11. An OPC method for correcting a photomask layout, the
25   photomask layout comprising:

a first photomask pattern including a first straight line, a second straight line, and a third straight line arranged in parallel with each other and in a first direction; and

a second photomask pattern;
30   wherein the first, the second, and the third straight lines respectively have a first line-end, a second line-end, and a third line-end closer to the second photomask pattern, wherein the second line-end is more

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protrudent than the first line-end and the third line-end and reaches to the second photomask pattern, a first distance is present between the first line-end and the second photomask pattern, and a second distance is present between the third line-end and the second

5   photomask pattern, the OPC method comprising:

performing a rule-based OPC process to generate a corrected photomask layout; and

adding a first enhancing feature and a second enhancing feature in the first line-end and the third line-end of the corrected photomask

10   layout   respectively, a width of the first enhancing feature and a width of the second enhancing feature being smaller than a width of each of the first straight line and a width the third straight line respectively, and both the first distance and the second distance being shortened."

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It is clear that the OPC method of the present application is used for correcting a photomask layout with a specific photomask pattern. And the specific photomask pattern comprises at least two parallel straight lines, wherein one of the straight lines having a line-end more

20   protrudent than the other one may be the main pattern of the photomask layout. Furthermore, according to the method of the present application, the enhancing feature is added to the straight line with shorter line-end after a rule-based OPC is performed, so that the bridge problem will not occur in the main pattern with the protrudent line-end. Therefore,

25   adding the enhancing feature to the shorter line-end of the straight line can solve the problem of line end shortening and provide a better lithography performance of the main pattern.
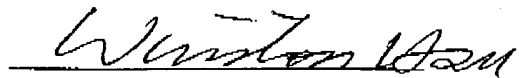
Compared to the prior art mentioned above, none of the prior art

30   patents mention performing a correction method to a photomask layout with the specific photomask pattern as disclosed in claims 1 and 11, which has at least two parallel straight lines. In addition, the prior art

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never teaches adding an enhancing feature to the straight line with a shorter line-end after performing a rule-based OPC. Therefore, the claimed invention of the present application is patentably distinct from the prior art. And the applicant believes that it is non-obvious for a

5 person of ordinary skill in the art at the time the invention was made to combine TP 408367 with TP 485271 or TP 499707 to realize the claimed limitations of the present application.

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Respectfully Submitted,

15 _Winston Hsu_   Date: 4/26/2004

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communication and I will return your call promptly.)

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Substitute for form 1449A/PTO	Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*	Application Number	10/707,025
	Filing Date	11/16/2003
	First Named Inventor	Teng-Yen Huang
	Art Unit	1756
	Examiner Name	
Sheet	1	of	1	Attorney Docket Number	NTCP0012USA

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] -Number[4] - Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	1	TW-408367	10-11-2000			+
	2	TW-485271	05-01-2002			+
	3	TW-499707	08-21-2002			+

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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TRANSMITTAL FORM	Application Number	10/707,025
	Filing Date	11/16/2003
(to be used for all correspondence after initial filing)	First Named Inventor	Teng-Yen Huang
	Art Unit	1756
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Total Number of Pages in This Submission 25	Attorney Docket Number	NTCP0012USA

ENCLOSURES   *(Check all that apply)*

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  - [ ] Fee Attached
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- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53

- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
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- [ ] CD, Number of CD(s) _____

Remarks

- [ ] After Allowance communication to Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Winston Hsu, Reg. No.: 41,526
Signature	*Winston Hsu*
Date	6/26/2004

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